

WHAT IS CLAIMED IS:

1. A method for fabricating a semiconductor laser device, comprising the steps of:

depositing an etching control layer, which has a composition different from that of a compound semiconductor substrate, over the entire surface of the substrate;

defining a first multilayer structure over the entire surface of the etching control layer, the first multilayer structure being made up of multiple semiconductor layers including a first active layer with a composition different from that of the etching control layer;

forming a first semiconductor laser structure out of the first multilayer structure on a first region of the substrate by selectively etching and patterning the first multilayer structure;

defining a second multilayer structure over the entire surface of the substrate as well as over the first semiconductor laser structure, the second multilayer structure being made up of multiple semiconductor layers including a second active layer; and

forming a second semiconductor laser structure out of the second multilayer structure on a second region of the substrate by selectively etching and patterning the second multilayer structure.

2. A method for fabricating a semiconductor laser device according to Claim 1, wherein the step of forming the first semiconductor laser structure is performed so that an etch rate of the first multilayer structure is higher than that of the etching control layer.

3. A method for fabricating a semiconductor laser device according to Claim 1, further comprising the step of selectively etching away part of the etching control layer, which exists on the second region, between the step of forming the first semiconductor laser structure and the step of defining the second multilayer structure.

4. A method for fabricating a semiconductor laser device according to Claim 1, further comprising the steps of:

depositing a buffer layer over the entire surface of the etching control layer between the step of depositing the etching control layer and the step of defining the first multilayer structure; and

selectively etching away part of the buffer layer, which exists on the second region, between the step of forming the first semiconductor laser structure and the step of defining the second multilayer structure.

5. A method for fabricating a semiconductor laser device

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according to Claim 4, wherein the step of selectively etching away the part of the buffer layer existing on the second region is performed so that an etch rate of the buffer layer is higher than that of the etching control layer.

6. A method for fabricating a semiconductor laser device according to Claim 4, wherein the etching control layer is formed out of a Group III-V compound semiconductor layer containing P, and

wherein the buffer layer is formed out of a GaAs layer.

7. A method for fabricating a semiconductor laser device according to Claim 1, wherein the compound semiconductor substrate is a GaAs substrate, and

wherein the etching control layer is formed out of a Group III-V compound semiconductor layer containing P.

8. A method for fabricating a semiconductor laser device according to Claim 1, wherein the etching control layer is made of $(Al_xGa_{1-x})_yI_{1-y}P$ (where $0 \leq x \leq 1$ and $0 \leq y \leq 1$), and

wherein the first multilayer structure includes semiconductor layers made of $Al_zGa_{1-z}As$ (where $0 \leq z \leq 1$).

9. A method for fabricating a semiconductor laser device according to Claim 1, wherein the etching control layer is

made of $\text{Al}_z\text{Ga}_{1-z}\text{As}$ (where $0 \leq z \leq 1$), and

wherein the first multilayer structure includes semiconductor layers made of $(\text{Al}_x\text{Ga}_{1-x})_y\text{I}_{1-y}\text{P}$ (where $0 \leq x \leq 1$ and $0 \leq y \leq 1$).

10. A semiconductor laser device comprising:

an etching control layer, which is formed on a first region of a compound semiconductor substrate and has a composition different from that of the substrate;

a first semiconductor laser structure, which is defined over the etching control layer and which is made up of multiple semiconductor layers including a first active layer with a composition different from that of the etching control layer; and

a second semiconductor laser structure, which is defined on a second region of the substrate and which is made up of multiple semiconductor layers including a second active layer.

11. A semiconductor laser device according to Claim 10, wherein no part of the etching control layer exists between the second region of the substrate and the second semiconductor laser structure.

12. A semiconductor laser device according to Claim 10,

wherein the etching control layer has a thickness of more than $0\mu\text{m}$ and equal to or less than $0.1\mu\text{m}$.

13. A semiconductor laser device according to Claim 10, further comprising a buffer layer between the etching control layer, formed on the first region of the substrate, and the first semiconductor laser structure.

14. A semiconductor laser device according to Claim 13, wherein the etching control layer is formed out of a Group III-V compound semiconductor layer containing P, and wherein the buffer layer is formed out of a GaAs layer.

15. A semiconductor laser device according to Claim 10, wherein the compound semiconductor substrate is a GaAs substrate, and

wherein the etching control layer is formed out of a Group III-V compound semiconductor layer containing P.

16. A semiconductor laser device according to Claim 10, wherein the etching control layer is made of $(\text{Al}_x\text{Ga}_{1-x})_y\text{I}_{1-y}\text{P}$ (where $0 \leq x \leq 1$ and $0 \leq y \leq 1$), and

wherein the first semiconductor laser structure includes semiconductor layers made of $\text{Al}_z\text{Ga}_{1-z}\text{As}$ (where $0 \leq z \leq 1$).

17. A semiconductor laser device according to Claim 10, wherein the etching control layer is made of $\text{Al}_z\text{Ga}_{1-z}\text{As}$ (where $0 \leq z \leq 1$), and

wherein the first multilayer structure includes semiconductor layers made of $(\text{Al}_x\text{Ga}_{1-x})_y\text{I}_{1-y}\text{P}$ (where $0 \leq x \leq 1$ and $0 \leq y \leq 1$).

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